



CLEAN REWRITTEN CLAIMS

- 1 1. A system comprising:
2 a network having a host coupled thereto, the host executing software
3 to generate packets for communication on the network;
4 a bus with a bus device coupled thereto;
5 an interface coupling the network to the bus, the interface and host
6 coordinating to tunnel bus events over the network between the host and
7 the bus device by encapsulating bus events into network protocols,
8 transferring the encapsulated bus events over the network, and
9 subsequently decapsulating the bus events to recreate the bus events.

- 1 2. The system defined in Claim 1 wherein the bus device
2 generates isochronous data and the network operates asynchronously, such
3 that isochronous data is transported over an asynchronous network.

- 1 3. The system defined in Claim 1 wherein the interface generates
2 network packets that encapsulate the bus events in a network protocol
3 portion.

1 4. The system defined in Claim 3 wherein the network protocol
2 portion comprises an Internet Protocol (IP) portion.

1 5. The system defined in Claim 3 wherein the network protocol
2 portion includes a header for information to recreate bus events.

1 6. The system defined in Claim 1 wherein each tunneled request
2 includes a tunneling header and a tunneling data portion, wherein the
3 tunneling data portion is specific to each tunneling packet type and
4 tunneling transaction type, and the tunneling header is common among
5 tunneling packet types.

1 7. The system defined in Claim 6 wherein the tunneling header
2 includes a field which specifies the type of packet as one of a group of
3 control packet, an information packet, or an ownership packet.

1 8. The system defined in Claim 6 wherein the tunneled packet
2 comprises an IEEE 1394 packet.

1 9. The system defined in Claim 6 wherein the tunneled packet
2 comprises a USB packet.

1 10. The system defined in Claim 6 wherein the tunneling header
2 indicates the packet type and transaction type.

1 11. A system comprising:
2 a network having a host coupled thereto, the host executing software
3 to generate packets for communication on the network;
4 a bus with a bus device coupled thereto;
5 an interface coupling the network to the bus, the interface and host
6 coordinating to tunnel bus events over the network between the host and
7 the bus device by encapsulating bus events into network protocols,
8 transferring the encapsulated bus events over the network, and
9 subsequently decapsulating the bus events to recreate the bus events,
10 wherein the host runs an application that generates packets for the bus
11 device and relies on an operating system that includes a driver for the bus
12 device that issues the bus device packets and redirects the bus device
13 packets to a network stack that encapsulates the bus device packets to create

14 a network packet and sends the network packet to a remote bus device via
15 the interface, the interface thereafter decapsulating the network packet to
16 obtain the bus device packet and forwarding the bus device packet to the
17 bus device.

1 12. A system comprising:
2 a network having a host coupled thereto, the host executing software
3 to generate packets for communication on the network;
4 a bus with a bus device coupled thereto;
5 an interface coupling the network to the bus, the interface and host
6 coordinating to tunnel bus events over the network between the host and
7 the bus device by encapsulating bus events into network protocols,
8 transferring the encapsulated bus events over the network, and
9 subsequently decapsulating the bus events to recreate the bus events,
10 wherein the bus device generates bus device packets for transport to the host
11 and sends the bus device packets on the bus, the interface encapsulating the
12 bus device packets into a network packet and forwards the network packet
13 to the host, the host executing a network driver that decapsulates the

14 network packet, identifies bus device packets therein and redirects the bus
15 device packets to a bus device driver running thereon.

1 13. The system defined in Claim 1 wherein the interface comprises
2 a remote peripheral server.

1 14. The system defined in Claim 1 wherein the network comprises
2 an Internet Protocol (IP) Ethernet network.

1 15. The system defined in Claim 1 wherein the bus comprises a
2 serial bus.

1 16. The system defined in Claim 1 wherein the bus comprises a
2 parallel bus.

1 17. The system defined in Claim 1 wherein the bus adheres to the
2 IEEE-1394 bus standard.

1 18. The system defined in Claim 1 wherein the bus adheres to the
2 Universal Bus Standard (USB).

1 19. A method of controlling devices across a network comprising:
2 capturing bus events generated on a bus;
3 encapsulating the captured bus events into packets associated with a
4 network protocol using an interface;
5 decapsulating the capsulated bus event and recreating them at a
6 remote site transparently to a user using information in the header of the
7 packet.

1 20. The method defined in Claim 19 where the remote site
2 comprises a similar bus and similar bus device to that which generated the
3 bus events.

1 21. An apparatus for controlling devices across the network
2 comprising:
3 means for capturing bus events generated on a bus;

4 means for encapsulating the captured bus events into packets
5 associated with a network protocol using an interface;
6 means for decapsulating the capsulated bus event and recreating
7 them at a remote site transparently to a user using information in the header
8 of the packet.

1 22. A system comprising:
2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;
5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the IEEE-1394 bus standard;
7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the
10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them.

1 23. The system defined in Claim 22 wherein the bus device
2 generates isochronous data and the network operates asynchronously, such
3 that isochronous data is transported over an asynchronous network.

1 24. The system defined in Claim 22 wherein the interface generates
2 network packets that encapsulate the bus events in a network protocol
3 portion.

1 25. The system defined in Claim 24 wherein the network protocol
2 portion includes a header for information to recreate bus events.

1 26. The system defined in Claim 24 wherein each tunneled request
2 includes a tunneling header and a tunneling data portion, wherein the
3 tunneling data portion is specific to each tunneling packet type and
4 tunneling transaction type, and the tunneling header is common among
5 tunneling packet types.

1 27. The system defined in Claim 26 wherein the tunneling header
2 includes a field which specifies the type of packet as one of a group of
3 control packet, a serial bus tunneled packet, or an ownership packet.

1 28. The system defined in Claim 27 wherein the tunneled packet
2 consists of an IEEE 1394 packet.

1 29. The system defined in Claim 22 wherein the tunneling header
2 indicates the packet type and transaction type.

1 30. A system comprising:
2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;
5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the IEEE-1394 bus standard;
7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the

10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them, wherein the host runs an application that
12 generates packets for the bus device and relies on an operating system that
13 includes a driver for the bus device that issues the bus device packets and
14 redirects the bus device packets to a network stack that encapsulates the bus
15 device packets to create a network packet and sends the network packet to a
16 remote bus device via the interface, the interface thereafter decapsulating the
17 network packet to obtain the bus device packet and forwarding the bus
18 device packet to the bus device.

1 31. A system comprising:

2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;

5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the IEEE-1394 bus standard;

7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the

10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them, wherein the bus device generates bus device
12 packets for transport to the host and sends the bus device packets on the
13 bus, the interface encapsulating the bus device packets into a network packet
14 and forwards the network packet to the host, the host executing a network
15 driver that de-encapsulates the network packet, identifies bus device packets
16 therein and redirects the bus device packets to a bus device driver running
17 thereon.

1 32. The system defined in Claim 22 wherein the interface
2 comprises a remote peripheral server.

1 33. A system comprising:
2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;
5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the USB bus standard;

7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the
10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them.

1 34. The system defined in Claim 33 wherein the bus device
2 generates isochronous data and the network operates asynchronously, such
3 that isochronous data is transported over an asynchronous network.

1 35. The system defined in Claim 33 wherein the interface generates
2 network packets that encapsulate the bus events in a network protocol
3 portion.

1 36. The system defined in Claim 33 wherein the tunneling header
2 includes a field which specifies the type of packet as one of a group of
3 control packet, a serial bus tunneled packet, or an ownership packet.

1 37. The system defined in Claim 36 wherein the tunneled packet
2 consists of a USB packet.

1 38. A system comprising:
2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;
5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the USB bus standard;
7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the
10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them, wherein the host runs an application that
12 generates packets for the bus device and relies on an operating system that
13 includes a driver for the bus device that issues the bus device packets and
14 redirects the bus device packets to a network stack that encapsulates the bus
15 device packets to create a network packet and sends the network packet to a
16 remote bus device via the interface, the interface thereafter decapsulating the

17 network packet to obtain the bus device packet and forwarding the bus
18 device packet to the bus device.

1 39. A system comprising:
2 an Internet Protocol (IP) Ethernet network having a host coupled
3 thereto, the host executing software to generate packets for communication
4 on the network;
5 a serial bus with a bus device coupled thereto, where transfers occur
6 to and from the bus device which adhere to the USB bus standard;
7 an interface coupling the network to the bus, the interface and host
8 coordinating to transport bus events between the host and the bus device via
9 tunneling bus events over the network by capturing and encapsulating the
10 bus events into network protocols and subsequently decapsulating the bus
11 events and recreating them, wherein the bus device generates bus device
12 packets for transport to the host and sends the bus device packets on the
13 bus, the interface encapsulating the bus device packets into a network packet
14 and forwards the network packet to the host, the host executing a network
15 driver that de-encapsulates the network packet, identifies bus device packets

16 therein and redirects the bus device packets to a bus device driver running
17 thereon.

AKK